DOCUMENT RESUME

ED 074 621 EA 005 021

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TITLE A Longitudinal Study of Fiscal Equalization in Illinois.
INSTITUTION Illinois State Univ., Normal. Dept. of Educational Administration.
PUB DATE Feb 73
NOTE 39p.; Paper presented at American Educational Research Association Annual Meeting (58th, New Orleans, Louisiana, February 26-March 1, 1973)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Economic Status; Educational Finance; Educational Research; *Equal Education; *Equalization Aid; Expenditure Per Student; *Property Taxes; School Taxes; *State Aid; *Tax Rates

ABSTRACT

Fiscal data were analyzed for a nine-year period (1963-1971) for all school districts in Illinois. Two hypotheses were tested relative to two different definitions of equalization -- "permissible variance" and "fiscal neutrality." Support was given to the notion of increasing interdistrict equality relative to expenditures and tax effort. Support was also given to the hypothesis that grants-in-aid have done little to change the proportion of total funds available to the poorer students of the State. (Author)

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A LONGITUDINAL STUDY OF FISCAL EQUALIZATION IN ILLINOIS*

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A paper prepared for the 1973 Annual Meeting
of the American Educational Research Association
New Orleans, Louisiana

*We are indebted to Illinois State University for faculty research grant #752-72-32 which supported a part of the expenses connected with this study.

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Introduction

This study was undertaken for two reasons. First, some of the data reported herein was used for various studies prepared for the Superintendent's Advisory Committee on School Finance. The Advisory Committee has produced four volumes of studies which will contribute to knowledge concerning school finance and, perhaps, also contribute to fiscal reform in Illinois.(1) Second, should the Courts move in the direction of applying a "reasonable basis" test to state school finance systems, and there is some recent evidence to indicate that this might occur,(2) it is likely that there will also be a demand for more longitudinal fiscal studies. This would arise because the Courts may wish to inquire what the "track record" of the legislative and executive branches of state government has been relative to such public policy goals as: (a) reducing fiscal disparities among school districts, and (b) encouraging the equalization of educational opportunity. A state which can demonstrate that it has moved "with all deliberate speed," through the years toward these goals, might well receive different treatment at the hands of the Court than a state which can show little or no progress toward the same goals.

To make this judgment, however, the Courts must first establish some justifiable standard of "fiscal equalization." This will not be an easy task.

Operational Definitions and Hypotheses

In an earlier study Hickrod, Chaudhari, and Tcheng established four models of fiscal equalization; that is, "permissible variance, inverse allocation, fiscal neutrality, and fiscal intervention." In that prior study we reviewed the relevant normative and empirical literature supporting each of these four theoretical constructs.(3) In this paper we have selected two of these definitions, e.g., permissible variance and fiscal neutrality, framed hypotheses in terms of these constructs, and then tested the hypotheses on the basis of a time series of data in a single state, Illinois. We also conducted some exploratory non-hypothetical investigation concerning fiscal effort among school districts of different wealth.

As Johns has stated there is no agreement concerning the most appropriate method of defining and measuring "equalization of educational opportunity" and only very limited agreement on defining and measuring "fiscal equalization."(4) The notion of a "permissible" or "allowable" variance is found in the work of Arthur Wise(5) and also it is implied in some of the computations

of the National Educational Finance Project.(6) There are several difficulties with the concept as Wise has himself pointed out. First, no one can say with certainty how much variation is "permissible." That is, we have no norms to judge whether a state has, or has not, exceeded the limits of "allowable" variation. As of this writing we have no judicial pronouncement at the state level equivalent to Judge Skelly Wright's ruling that there could be no more than a five per cent variation between expenditure levels of individual schools within a single school district.(7) Second, and far more important, there is no agreement on what to measure; that is, inputs such as expenditures, services, tax rates, etc. or outputs such as achievement test scores and continuation rates. Third, various statistical techniques are available to monitor inequality and each researcher seems to select that measure which is most familiar to him.(8)

In spite of the limitations of the notion of "permissible variance" we believe the concept has some intuitive appeal to the Courts and to state legislatures and have therefore used it in the Illinois studies. Lacking a good output measurement in Illinois we selected three input measures that will probably be of interest to the Courts, e.g., expenditure per pupil, property valuation per pupil, and two types of tax rates. Upon reviewing the

different types of statistics used to describe dispersion in a set of data we find that the coefficient of variation, that is, the standard deviation divided by the mean and multiplied by 100 is the most popular choice and accordingly have used that descriptive statistic in this portion of the study. In Illinois three types of districts are present; elementaries, high schools, and units (K-12). Since it would mix apples and oranges to pool these different types, especially with regard to fiscal characteristics, separate time series have been established for each district type.

To frame a longitudinal hypothesis we have drawn upon both studies of school finance in metropolitan areas, and upon a single national study which provided evidence on fiscal variation within each of the fifty states. It was over a decade ago that Jesse Burkhead established an hypothesis of "increasing fiscal homogeneity" on the basis of studies he had conducted in the Cleveland metropolitan area.(9) Basically this hypothesis holds that with the passage of time school districts will become more alike with regard to expenditure levels, tax rates, property valuations per pupil, and other fiscal characteristics. This hypothesis assumes that the locational decisions of business and industry, plus the movements of people in selecting their places of residence will act, at least in

the long run, to level out fiscal differences between school districts. Empirical support for this notion has certainly been uneven, but it is not disproved at this point in time.(10) Not an inconsiderable stumbling block is an answer to the question of just what constitutes, "in the long run"? Second, at the state level the most extensive data on input variation within individual states comes from the national study by Harrison and McLoone.(11) This study concluded that we probably are moving toward greater expenditure equality if the geographic area studied was that of the entire United States, and the same trend held for a majority of states. On the basis of these prior studies of fiscal disparity, plus some random speculation about the possible effects of collective bargaining in recent years, we established an hypothesis of decreasing fiscal inequality among school districts.

Our second hypothesis is drawn from literature and Court decisions of more recent vintage. A number of recent decisions have highlighted an emerging principle of "fiscal neutrality."(12) In its most basic form this principle holds that, "school district expenditure shall not be a function of wealth other than the wealth of the state." Unfortunately there has been more legal and philosophical discussion of this notion than mathematical and statistical specifications of the construct. A descriptive statistic

used extensively in the field of economics and known variously as the "Gini Coefficient, Gini Index, and Index of Concentration," is probably as acceptable as any other measurement technique, and may have some advantages over other techniques currently in use among fiscal analysts.(13) The Gini numbers are purely relative; that is, they have meaning only when comparing different years or different distributions of funds within a single year. In general, as these numbers become smaller there is more fiscal neutrality in the state system, and as they become larger there is less fiscal neutrality in the state system. A graphic presentation of the data, the Lorenz curve, can be used in conjunction with the Gini coefficient and when this is done the diagonal 45 degree line represents complete fiscal neutrality. This interpretation, however, depends upon what variables are used on the vertical and horizontal coordinates of that graph. Under certain situations, for example when using state aid as one of the variables, the larger the coefficient the greater the distribution of funds to poorer districts. We have prepared an appendix to this paper giving the mathematical derivation of the coefficient, an illustration of the curves, and the computational procedure for those who are interested in such details.

To frame a longitudinal hypothesis we have relied upon Coons, Clune, and Sugarman.(14) The investigations

conducted by these authors have led them to believe that the political compromises necessary to pass formula legislation result in distributions that are deliberately "flawed," that is, distributions that give more funds to the wealthier districts than the designers of the formulas intended prior to the "horse trading" necessary in most state legislatures. Similar conclusions are reached by Grubb and Michelson.(15) We were unable to discover, however, any empirical work which could cast light on whether individual states were moving toward greater fiscal neutrality or away from greater fiscal neutrality and hence a further motivation for this paper. Persuaded by the forceful rhetoric of advocates Coons, Clune, and Sugarman we decided that the inevitable conflict between the affluent schools and the poor schools probably produces something of a "status quo" as far as the sharing of total expenditures is concerned. Accordingly, we established an hypothesis of no improvement in fiscal neutrality with the passage of time.

Findings: Simple Disparity

The results of the simple disparity analysis are presented in figures one through four. The downward sloping line in the graphs indicates that the value of the coefficient of variation has been falling and that school districts

in Illinois are becoming more alike with the passage of time. In figure one we can see that this is true for current operating expenditures per pupil especially for the period 1965 through 1971. In an area that sorely needs some good news we are pleased to indicate this fairly optimistic finding. If expenditures are related to the level of goods and services provided, and if these expenditures make at least some small difference in students' achievement then there was probably greater equality of educational opportunity at the end of the period in Illinois than at the beginning of the period. These are, to be sure, monumental ifs, and current research does not reassure one that the assumptions are valid.(16) Nothing here tells us why expenditures are becoming more alike among school districts, only that they are. Figures two and three tell us that the same phenomenon has occurred relative to tax effort. There is therefore less tax inequality at the end of the period than at the beginning of the period. The current very strong demand for local property tax relief in Illinois may well be more of a response to the overall level of taxes than to the inequality of tax effort among districts.

One causal element we can at least rule out at this point. Both the phenomena of decreasing disparity in expenditures and decreasing disparity in tax effort could

be taking place if school districts were becoming more alike with regard to wealth as measured by property valuation per pupil. However, the data of figure four suggest that this is probably not an important factor. Unit districts were about as unequal with regard to wealth at the end of the time period as they were at the beginning of the time period and elementary districts were more unequal with regard to wealth than they were at the beginning of the time period. Only the high school districts illustrate a reduction of variation in wealth. Parenthetically this also tells us that if the goal of the school district reorganization in recent years in Illinois has been to reduce wealth disparities that reorganization has succeeded only with regard to high school districts. Of course the variance in property valuations among school districts is affected by complex locational decisions of individuals and corporations and not solely by school district reorganization.

We find, therefore, that our first hypothesis is supported with regard to expenditures and tax effort but not with regard to property valuation per pupil. At least, the evidence on this last variable is mixed. This leads us to speculate that the forces working to equalize expenditures and tax effort may not be related to those forces affecting property valuations per pupil. It is entirely possible that some sort of "demonstration effect"

enhanced now by more rapid means of communication is causing school district expenditures to become more alike with the passage of time. Speculation of this sort was advanced some time ago by Benson.(17) It is also possible that collective bargaining by teachers organizations plays an important role in this increasing equality of expenditure levels. News concerning salary settlements travels very fast in Illinois and this may well have had an overall leveling effect on expenditures throughout the state. Of course, we have no way of testing such speculation within the design of the investigation reported here.

Findings: Fiscal Neutrality

Figures five, six, and seven illustrate the data on fiscal neutrality. Gini coefficients were computed for both locally raised revenue and for the combination of state funds plus locally raised. Thus the difference between the upper and the lower lines on the graphs represent the contribution state funds have made to fiscal neutrality at any given point in time. The lower the Gini value, the greater the fiscal neutrality with absolute fiscal neutrality constituting the base of the vertical axis. In a rather loose sense, the upper line represents what the fiscal neutrality picture would have been like had there been no state aid at all and expenditures had been a function

entirely of local wealth variations and local willingness to spend. The values of the Gini coefficients we have computed for Illinois tend to be slightly smaller than those reported for fifteen other states by Grubb and Michelson.(18) For example, these researchers report a Gini value of .0792 for Louisiana in 1969. Our comparable Gini values for Illinois for the same year are: .0314 for units, .0513 for elementaries, and .0595 for high schools. However, some differences in defining state or local funds, or some computational differences, could well account for differences of this magnitude and we would therefore be hesitant to draw any conclusions from the smaller size of the Illinois coefficients.

As was expected the greatest departure from absolute fiscal neutrality occurred among the elementary districts in Illinois. It happens that the 1969 data cited above are an exception to this rule. Returning for a moment to figure four one can easily see why this would probably be true; e.g., the local wealth variation is much greater for elementary districts in Illinois than for unit districts and high school districts. A decreasing fiscal neutrality due to local wealth and/or local willingness to spend variations can be documented for high school districts and elementary districts but an increasing fiscal neutrality caused by local wealth and/or willingness to spend

variations can be observed for unit districts. That is, the upper lines in figures five and six are positively sloped while the upper line in figure seven is negatively sloped. However, our interest in these upper lines is not nearly as great as is our interest in the bottom lines which display the combined effects of both state and local funds. Federal aid is not reflected in any of the data reported here.

Figure six shows a slight improvement in fiscal neutrality for students in elementary districts in Illinois during the period under investigation; however, all of this improvement was prior to 1968 and there has been no improvement since that date. Figures five and seven indicate virtually the same amount of fiscal neutrality for students in unit districts and high school districts at the end of the period as existed at the beginning of the period. We thus believe that our second hypothesis has also been sustained. There has been no marked improvement in fiscal neutrality, at least as we have operationally defined this concept, in Illinois during the years from 1965 to 1971. It should be stressed that the data displayed in figures five, six, and seven are intended to cast light upon the <u>combined</u> effect of both state and local funds since the formulation, "expenditure shall not be a function of wealth, other than the wealth of the state," is also focused

upon this combined effect. However, the legislature may well be interested in the effect of the state funds alone, particularly in the effect of the general purpose grants-in-aid which, in most states, are deliberately intended to be "equalizing" in their effect.(19) The data displayed in figure eight casts some light upon this subject.

As indicated in the appendix placing state aid on the vertical axis rather than revenues from a given source results in a different interpretation of the Gini coefficient. In this particular case, the higher the value of the coefficient, the greater the proportion of funds being directed to the poorer school districts. As can be observed from figure eight the trends have not been the same for all three categories of school districts in Illinois. The students in the poorer high school districts have been receiving a greater share of state aid with the passage of time. However, the students in the poorer elementary districts and the poorer unit districts have suffered a reduction in their share of state aid. In an earlier version of this paper we concentrated solely upon the poorest quartile of students with essentially the same results.(20)

A very interesting phenomenon can be observed here that probably applies to other states which have separate elementary, secondary, and unit districts; i.e., the

so-called "dual district" states. During the period under analysis in Illinois the foundation level was raised faster than the qualifying rate. Most observers of the "foundation" grant-in-aid systems would predict that when this phenomenon occurs the poorer students will receive a smaller percentage of state aid since more wealthy districts are becoming entitled to equalization grants. That has, indeed, happened in Illinois for students in unit districts and in elementary districts. However, this very same phenomenon has had exactly the opposite effect for students in high school districts. Raising the foundation level and holding the qualifying rate constant or at least not raising the rate very much has placed funds into some of the poorer secondary districts since these poorer secondary districts are toward the upper half of the overall wealth distribution. This largely unintended consequence is unfortunately typical of the complexities found in the so-called "dual district" states and makes rational state fiscal planning very hazardous in these states.

Findings: Fiscal Effort

The Advisory Committee invested a good deal of its time exploring the concept of "equal expenditure for equal effort.(21) A large number of formulae which allowed districts to receive funds in proportion to their local tax

effort were constructed and then simulated by computer. It was therefore logical for the Committee to ask, "will any of these effort formulae help poor districts?" Longitudinal data of the type reported here can not really answer this type of question very well. The adoption of a completely new formula brings into being forces that were simply not there before. That is, the assumption underlying projections from a time series, i.e., that conditions in the future will be similar to conditions in the immediate past, is very suspect. Nevertheless, we thought it useful to at least look at some effort data in longitudinal perspective.

Our procedure was similar to that reported in the previous section. We ranked the districts from low to high in terms of per student property valuations and then cumulated by enrollments toward the top, breaking at each quartile. Figures nine, ten, and eleven assemble tax rate data by wealth quartiles for the period 1965 through 1971. Each quartile consists of the districts which contain one-fourth of the students ranked by wealth. The tax rates indicated are weighted averages; that is, we took the expenditures for all educational purposes in each quartile and then divided by the total property valuation in that quartile. The line at the bottom indicates the tax rate difference between the richest quartile and the poorest

quartile.

The first relationship we can observe from figures nine, ten, and eleven is that the districts which contain the wealthiest quartile of students has the lowest tax effort, and the poorest quartile has the highest tax effort. In fact, with a few exceptions, e.g., prior to 1967 for unit districts, and in 1971 for high school districts, this relationship of wealth to tax effort has been similar every year since 1965. One could therefore conclude that the immediate or short-run effect of adopting a formula which was weighted heavily for local district tax effort would be to put more funds into the poorer districts. We are, however, also interested in trends through time. Here the results are not quite so reassuring, if the goal is greater equalization. For unit districts and for high school districts the difference between the wealthiest quartile and the poorest quartile has been fairly constant during the period under examination. However, with regard to elementary districts the difference between the two quartiles has narrowed with the passage of time, and one can see by inspection of figure ten that this was due to increased effort by the wealthier quartile since 1968. Figure eleven also reveals a strong upward thrust of effort from the second wealthiest quartile of the high school districts. Thus there is a modest indication in the data that

the wealthier of the so-called "dual districts" in Illinois have been exerting greater effort with the passage of time.

Critics of "effort" formulae, also called "incentive" or "stimulation" or "district power" formulae, allege that when a bonus is placed into the formula to reward local effort it will be the wealthier districts that will respond to the stimula rather than the poorer districts.(22) It is difficult to subject this notion to a direct test. About all we are prepared to do at this point is to hazard a guess that the initial or short-range effect of the adoption of an effort formula would be to help poorer districts but that this gain in equalization might be greatly weakened at some later point in time as the richer districts begin to exert greater effort. Effort formulae will probably become a popular means by which states seek to meet court decisions. When challenged, a state will allege that its formula does not make expenditures a function of local wealth, but rather a function of willingness to exert tax effort for education. The various effort formulas can be slowly adjusted to the point where any two districts exerting the same tax effort can have <u>almost</u> the same expenditure level. Technically they can be adjusted so that any two districts have exactly the same expenditure levels but this procedure is usually too costly to the state. However, if willingness to tax and wealth are highly

correlated then an application of the Gini coefficient as described in the previous section will still show a lack of fiscal neutrality even if an effort formula has been adopted by the legislature. Effort formulae are no panacea; at best they may provide a convenient resting station on the way from where we are now toward full state funding.

Conclusions and Qualifications

The observed reduction in disparity among school districts relative to expenditure levels and tax rates is a good omen as this state, along with others, awaits the Courts' pleasure in Rodriguez and similar cases. However, we can find little evidence to indicate that this reduction in disparity in expenditure and tax rates was the intended result of deliberate state fiscal policy. To the contrary, there is some evidence that the students in the poorer districts of Illinois have fared worse in recent years relative to their share of state aid. It is also clear that Illinois was not much closer to fiscal neutrality in 1971 than it was in 1965. It is more apparent to us now than it was when we started this investigation that the two concepts, "permissible variance," and "fiscal neutrality," are more dissimilar than they are similar. Variance in expenditures could be decreasing but that variance could

still remain a function of local wealth and/or local willingness to spend. If the Courts are really intent upon establishing fiscal neutrality then it appears to us that the Gini coefficient would be a more appropriate criterion than any measurement of simple dispersion.

As usual, there are unresolved measurement problems in this area of school finance research as in most other areas. For example, it is difficult to compare the results of an analysis with the coefficient of variation with the results of an investigation with the Gini coefficient when one method uses the district as the unit of analysis and the other uses the student as the unit of analysis. As indicated in the appendix, the horizontal axis is the cumulative ADA as ranked by wealth not the cumulative count of districts. That is, we are analyzing what proportion of expenditures, or in a few cases what proportion of state aid has been accorded to the poorest 10 per cent, 15 per cent, 20 per cent, etc. of students rather than the poorest 10 per cent, 15 per cent, 20 per cent, etc. of districts.

A much more serious qualification lies in the specification of district wealth. The "poorest" students are defined in this paper as poor in terms of the property valuations per pupil of their district. One has only to reflect upon the fact that in Illinois the city of Chicago is in the upper half of the per pupil property distribution

to realize that most of the efforts to aid Chicago, for example the inclusion in the general aid formula of a bonus for large districts, would have the effect of decreasing the measurement of fiscal neutrality as it has been defined and used here. When income data is available for each school district in Illinois a different specification of wealth can be used and new Gini coefficients will then need to be computed using this different measurement of wealth. Unfortunately, obtaining a reliable measure of income among school districts for one point in time has been a very slow process and it may be a very long, long time indeed before we have a reliable time series of income data for each school district in the state; if indeed we ever have such measurements.

In conclusion we wish to specifically disavow any usage of these data to justify some philosophy of "benign neglect" on the part of any branch of Illinois state government. In the first place we doubt very much that the students in the poorer districts of this state will be willing to wait for unassisted market forces to level out expenditures and tax rates. Such a process might take decades. Secondly, we believe that the goal of fiscal neutrality is just as compelling if not more compelling than the simple reduction of fiscal disparities among school districts. Regardless of the outcome of current

litigation on this subject, it appears to us that the determination of service levels by the wealth of a local district is not functional to the larger body politic and we have said this in many ways, for many years.(23)

Notes and References

1. Occasional Papers of the Superintendent's Advisory Committee on School Finance, Volumes One, Two, and Three, 1972, and also Final Report of the Superintendent's Advisory Committee on School Finance, 1973. These documents are available from Robert Clark, Director, Legislative Research, Office of the Superintendent of Public Instruction, 302 State Office Building, Springfield, Illinois, 62706

2. See for example, Judge Alexander Harvey's opinion in Parker v. Mandel, U.S. District Court for the District of Maryland, June 14, 1972.

3. Hickrod, G. Alan, Chaudhari, Ramesh, and Tcheng, Tse-Hao, "Definition, Measurement, and Application of the Concept of Equalization in School Finance," Occasional Papers of the Superintendent's Advisory Committee, Volume One, 1972. An abbreviated version appears in Proceedings of the 15th National Conference on School Finance, 1972, National Education Association, Washington, D.C., and the complete text is available as document ED 060 544 in the ERIC system.

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12. See especially Serrano v. Priest, Van Dusartz v. Hatfield, and Rodrigues v. San Antonio School District, NOLPE School Law Journal, Spring, 1972.

13. For additional illustrations of the use of the Gini coefficient in school finance research see Harrison and McLoone, op. cit.; Barkin, David, The Equalizing Impact of State Aid to Education, 1967, Washington University Institute for Urban and Regional Studies, St. Louis; Hickrod, G. Alan, "Dispersion of Fiscal Characteristics Among School Districts in a Metropolitan Area," Educational Administration Quarterly, Autumn, 1967; Wilensky, Gail R., State Aid and Educational Opportunity, 1970, Sage Publications; Michelson, Stephan, "The Political Economy of Public School Finance" in Carnoy, Martin, Schooling in a Corporate Society, 1972, McKay; Grubb, W. Norton and Michelson, Stephan, Public School Finance in Contractual Societies, unpublished, Cambridge, Mass.; see also Grubb's review of the NEFP studies in Harvard Educational Review, November, 1972.

14. Coons, John E., Clune, William H. III, and Sugarman, Stephen D., Private Wealth and Public Education, 1970, Harvard University Press.

15. Grubb and Michelson, op. cit.

16. For three quite different views on the contribution of school variables to achievement one might compare these items: Guthrie, James W., "A Survey of School Effectiveness Studies," Do Teachers Make a Difference?, U.S. Office of Education, 1970; Averch, Harvey A., Carroll, Stephen J., Donaldson, Theodore S., Kiesling, Herbert J., and Pincus, John, How Effective is Schooling?, Rand Corporation, 1972; Jencks, Christopher, Inequality, 1972, Basic Books.

17. Benson, Charles S., The Economics of Public Education, First Edition, 1961, Houghton Mifflin.

18. Grubb and Michelson, op. cit.

19. Just how "equalizing" the present general purpose state grants-in-aid really are, is, at least in this author's opinion, still an unanswered question. Probably we will never answer the question until we get more agreement on how to define and measure "fiscal equalization." For a range of different approaches to this basic problem see Johns, Roe L. et al., Status and Impact of Educational Finance Programs, 1971, National Educational Finance Project, Gainesville, Florida; Hickrod, G. Alan, Chaudhari, Ramesh, and Tcheng, Tse-Hao, op. cit.; Grubb, W. Norton and Michelson, Stephan, op. cit.; McLure, William P. et al., Education for the Future of Illinois, 1966, OSPI, Springfield, Illinois.

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21. Final Report, Superintendent's Advisory Committee on School Finance, 1973, Springfield, Illinois.

22. See Alternative Programs for Financing Education, 1971, NEFP; also Grubb and Michelson, op. cit.

23. Hickrod, G. Alan and Hubbard, Ben C., "Social Stratification, Educational Opportunity, and the Role of State Departments of Education," Educational Administration Quarterly, Winter, 1968.

Area B is the area under the curve and if n is the number of districts, and

x_i = cumulative proportion of ADA for the ith district

y_i = cumulative proportion of $ for the ith district

Then $$\text{Area B} = \sum_{i=1}^{n} \frac{(x_i - x_{i-1})(y_{i-1} + y_i)}{2}$$

or $$2 \text{ Area B} = \sum_{i=1}^{n} (x_i y_{i-1} - x_{i-1}y_{i-1} + x_i y_i - x_{i-1}y_i)$$

$$= (x_i y_0 - x_0 y_0 + x_1 y_1 - x_0 y_1 + x_2 y_1 - x_1 y_1 + x_2 y_2 - x_1 y_2 + x_n y_{n-1} - x_{n-1} y_{n-1} + x_n y_n - x_{n-1} y_n)$$

$$= (x_2 y_1 - x_1 y_2) + (x_3 y_2 - x_2 y_3) + \ldots + (x_n y_{n-1} - x_{n-1} y_n) + x_n y_n$$

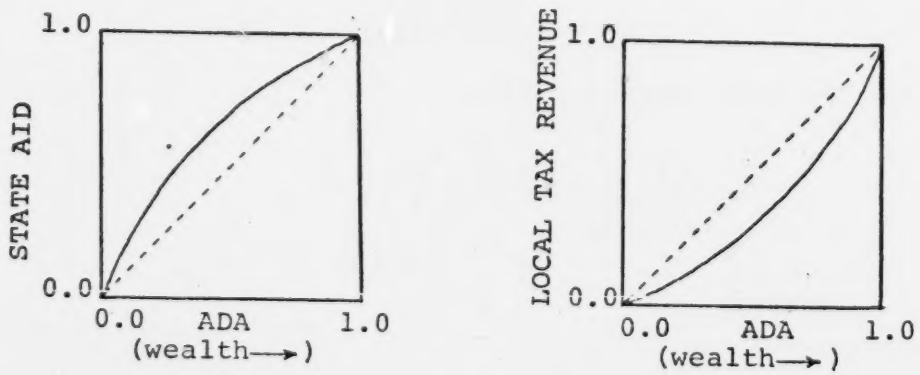
$$= \sum_{n=2}^{n} (x_i y_{i-1} - x_{i-1} y_i) + 1 \qquad (2)$$

$$= 1 - \sum_{n=2}^{n} (x_{i-1} y_i - x_i y_{i-1})$$

substituting the value of area B in eq 1

$$G = \sum_{n=2}^{n} (x_{i-1} y_i - x_i y_{i-1}) \qquad (3)$$

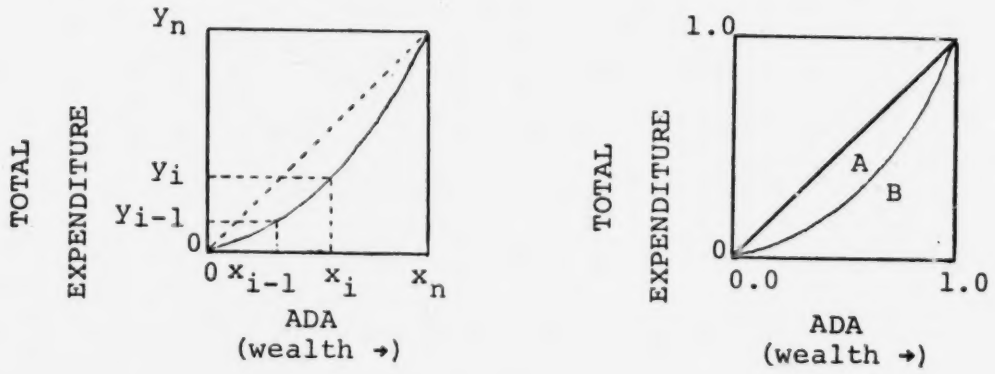
Gini Coefficient for State Aid:



APPENDIX A

COMPUTATION OF GINI COEFFICIENT

For measuring equalization, the districts are sorted in ascending order of wealth which is defined as assessed valuation per pupil in Average Daily Attendance. The cumulative proportions of total operating expenditures accounted for by these districts are represented by the vertical axis. The curve thus plotted



would be a straight line at 45° to both axes if the total operating expenditures were equal in all districts--poor as well as wealthy. However, a sagging curve represents lesser expenditures in poor districts and suggests some inequity. The measure of this inequity as defined by gini coefficient G is given by the formula:

$$G = \frac{\text{Area A}}{\text{Area (A+B)}}$$

or after further simplification

$$G = \frac{0{\cdot}5 - \text{Area B}}{0{\cdot}5}$$

$$= 1 - 2 \text{ Area B} \qquad (1)$$

Since poor districts get more state aid than wealthy districts, the curve in this case will be above the diagonal and formula 3 would result in a negative value of G. To avoid confusion we reverse the sign of G to make it positive. However, Gini coefficient as applied to state aid must be interpreted differently. The higher the value of G in this case, the better it is for poor districts and the higher is the equalization. On the other hand higher values of Gini coefficients for total expenditure and local revenue indicate lesser equalization.

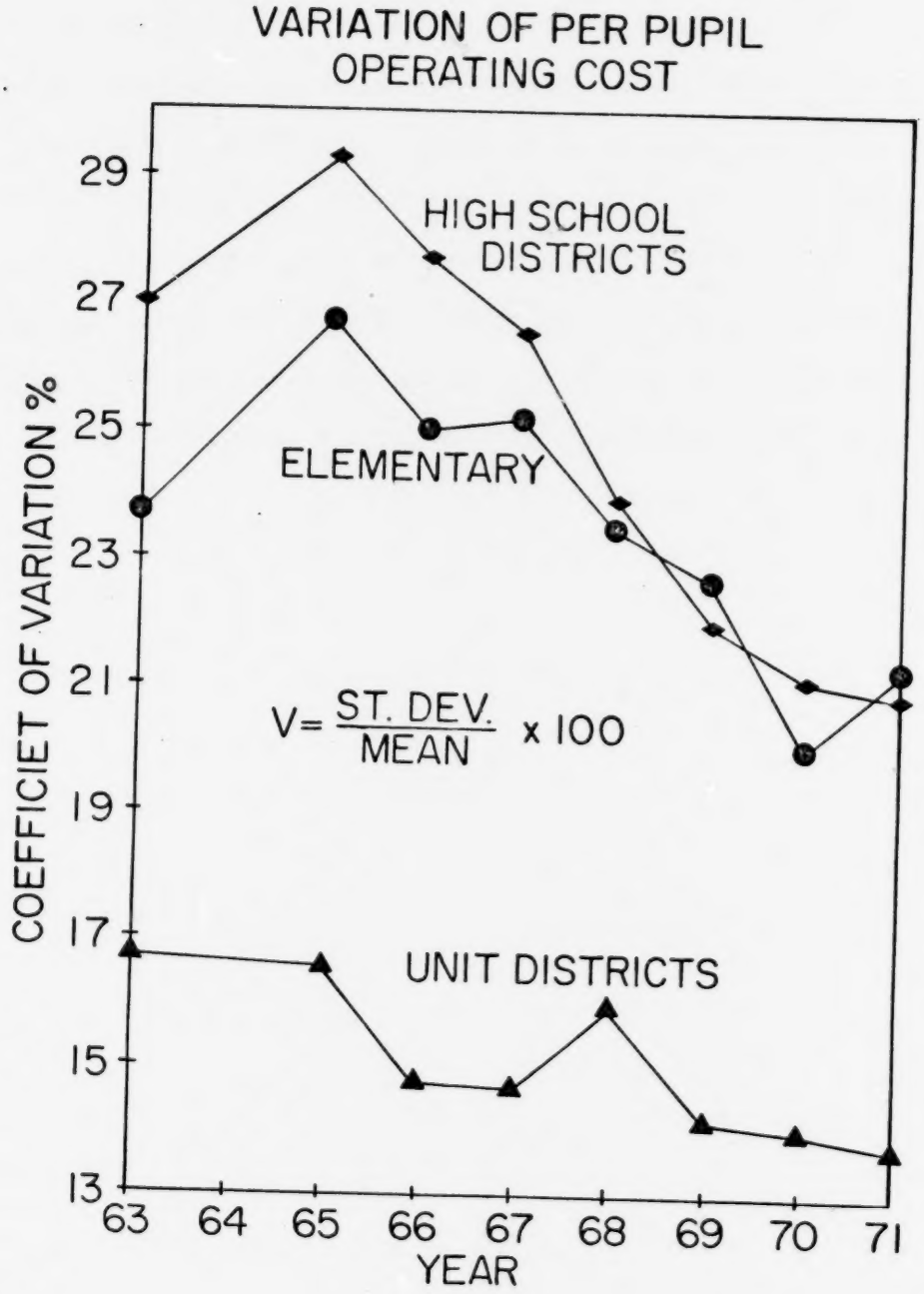

VARIATION OF PER PUPIL
OPERATING COST
HIGH SCHOOL
DISTRICTS
ELEMENTARY
UNIT DISTRICTS
V= ST. DEV. / MEAN x 100
COEFFICIET OF VARIATION %
29
27
25
23
21
19
17
15
13
63
64
65
66
67
68
69
70
71
YEAR

FIGURE 1.

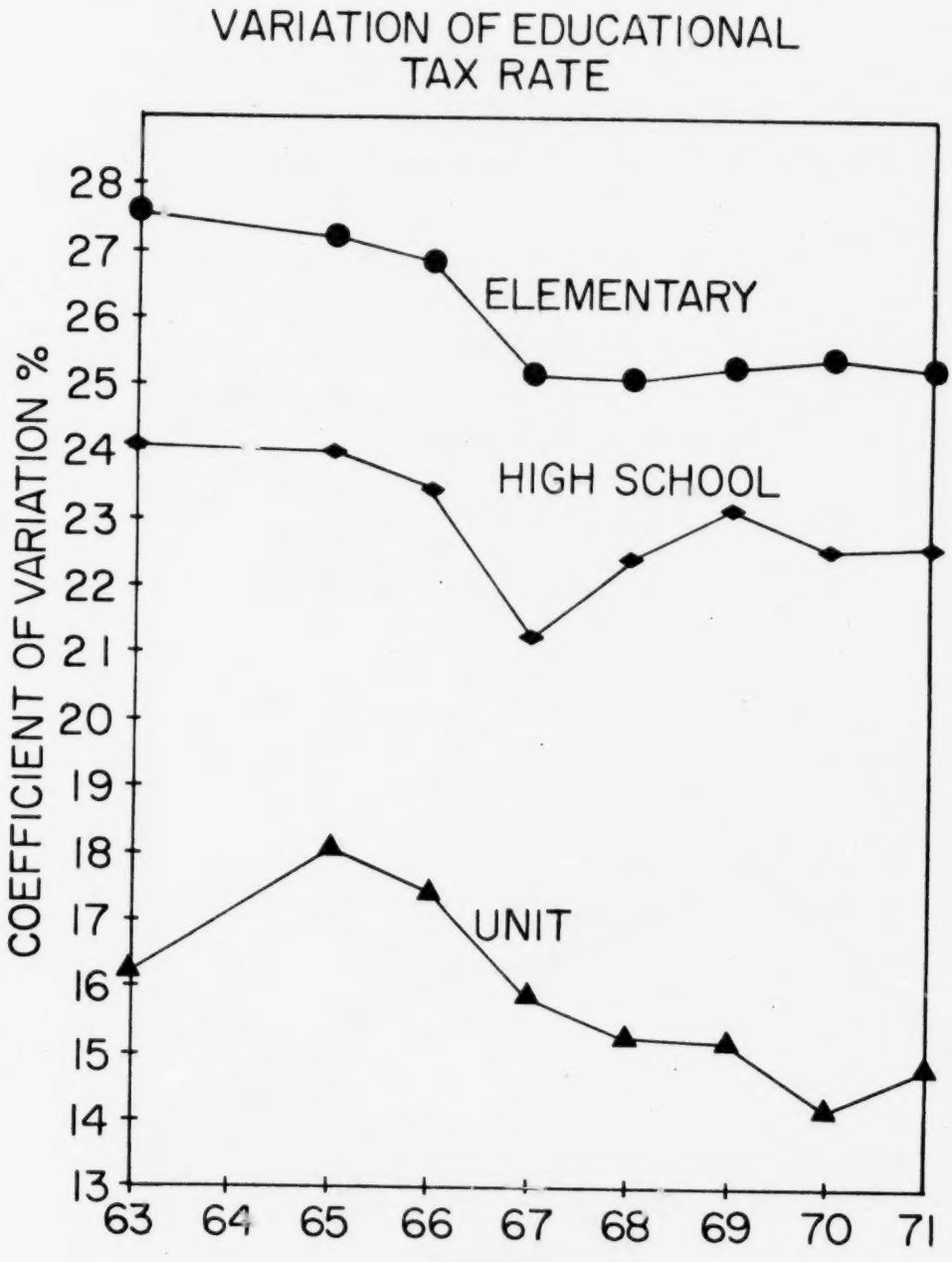

VARIATION OF EDUCATIONAL
TAX RATE
COEFFICIENT OF VARIATION %
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
ELEMENTARY
HIGH SCHOOL
UNIT
63
64
65
66
67
68
69
70
71
YEAR

FIGURE 2.

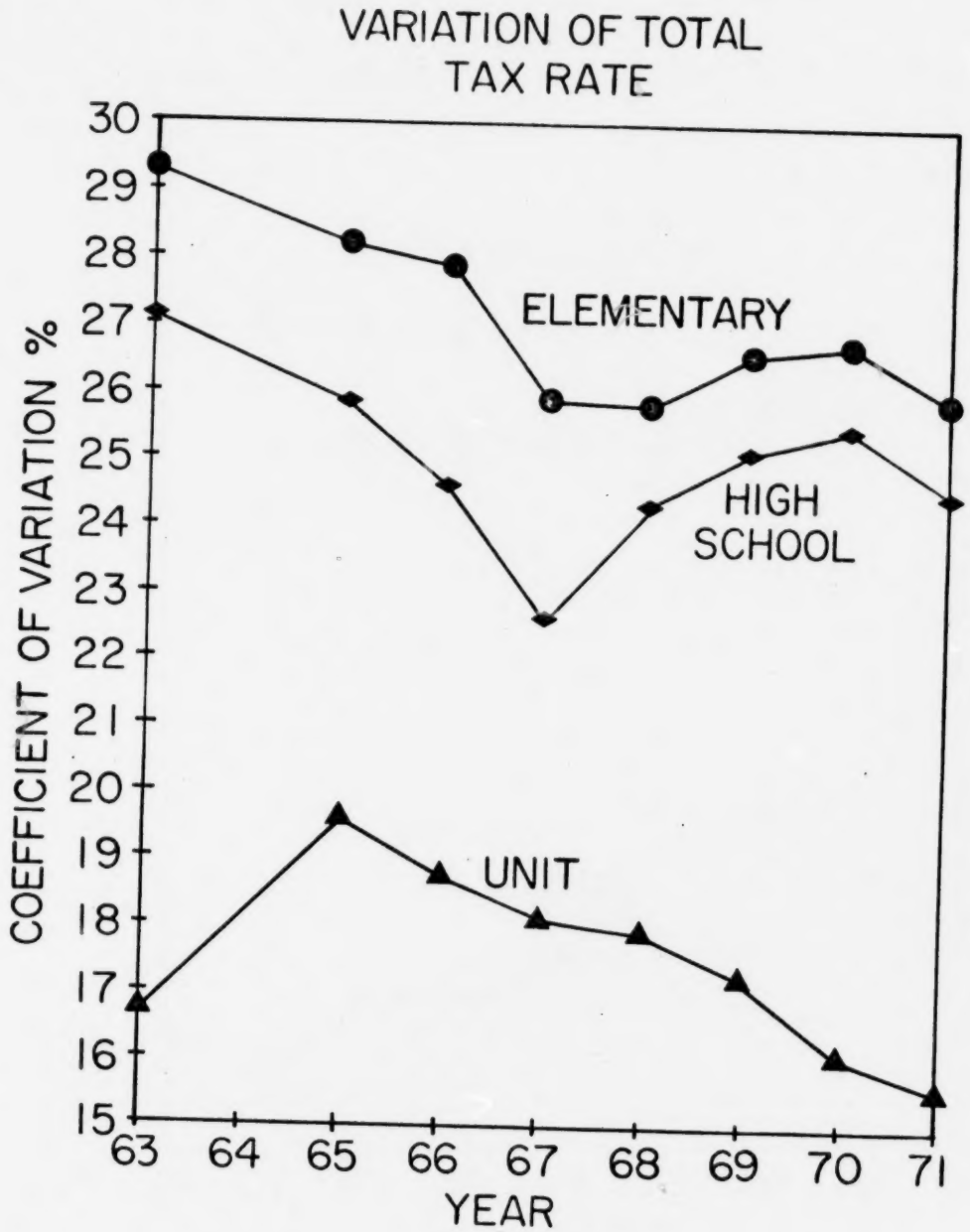

VARIATION OF TOTAL
TAX RATE
COEFFICIENT OF VARIATION %
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
ELEMENTARY
HIGH
SCHOOL
UNIT
63
64
65
66
67
68
69
70
71
YEAR

FIGURE 3.

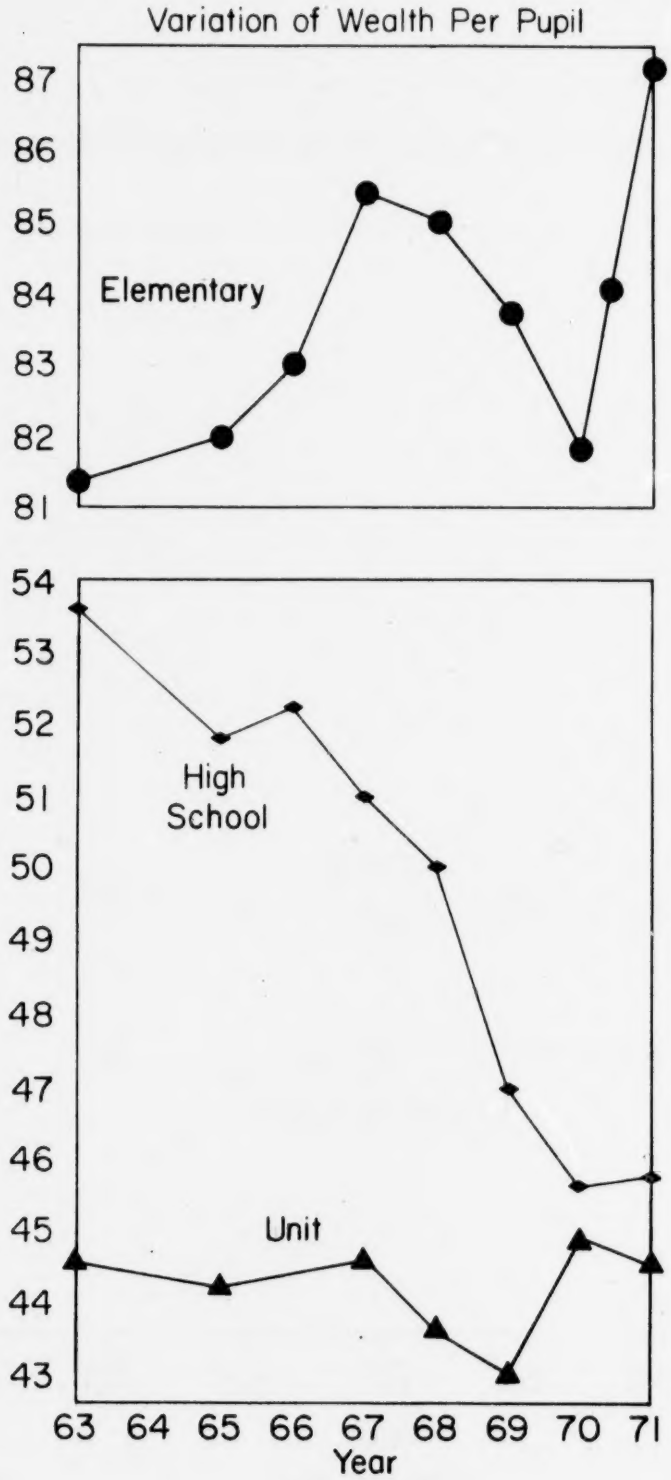

Variation of Wealth Per Pupil
87
86
85
84
83
82
81
Elementary
54
53
52
51
50
49
48
47
46
45
44
43
High School
Unit
63 64 65 66 67 68 69 70 71
Year

Figure 4.

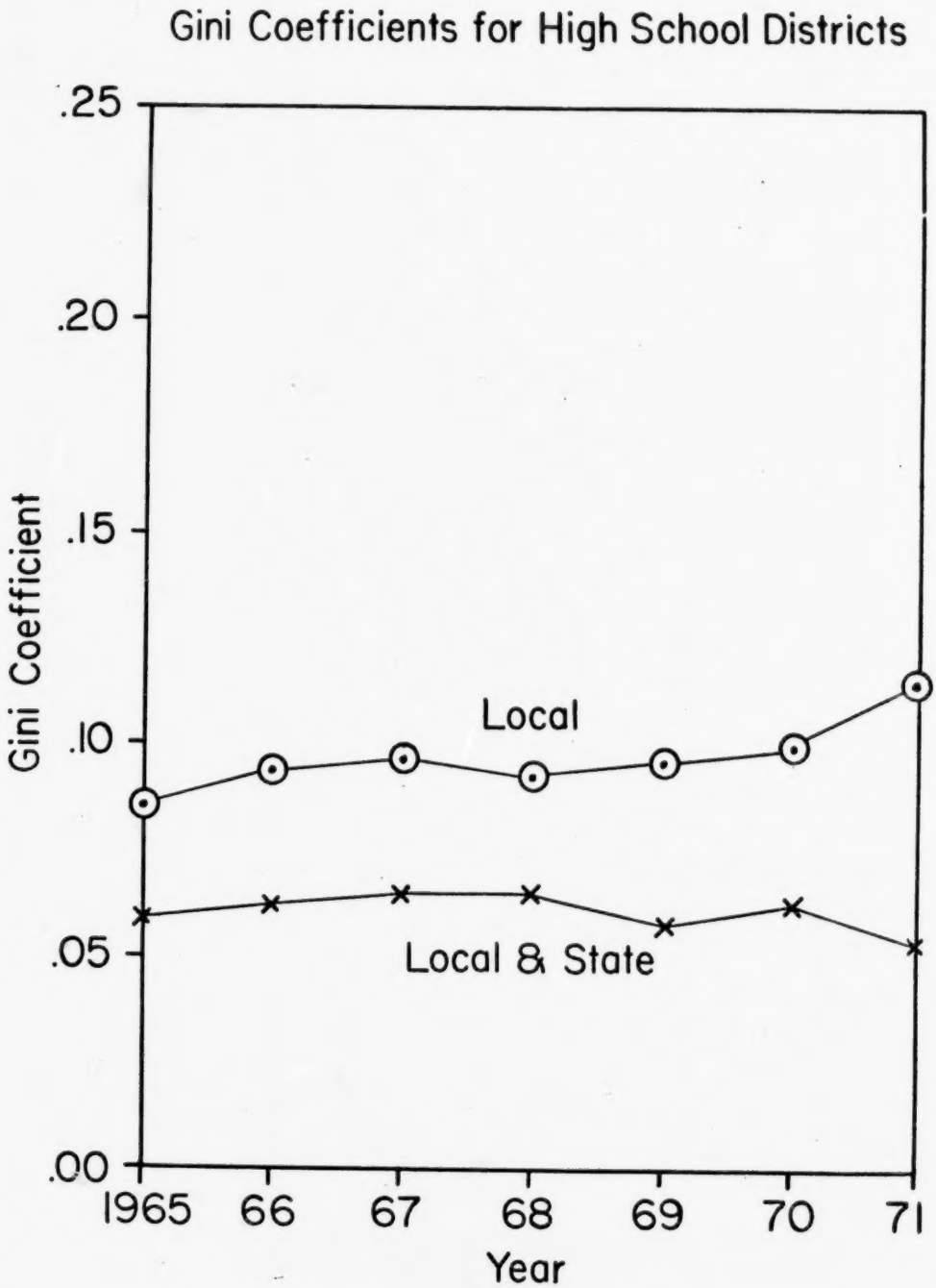

Gini Coefficients for High School Districts
.25
.20
.15
.10
.05
.00
Gini Coefficient
Local
Local & State
1965
66
67
68
69
70
71
Year

Figure 5.

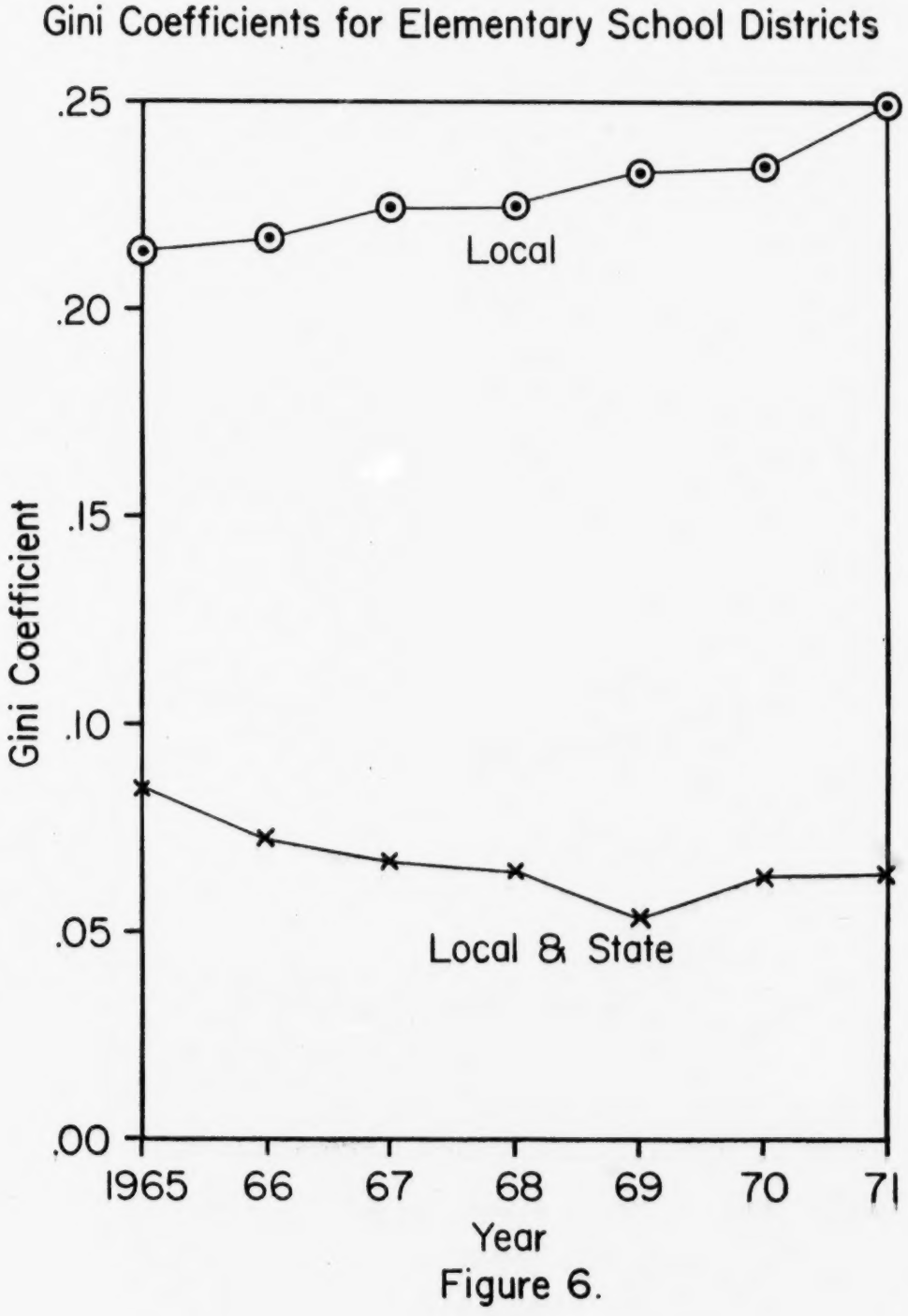

Gini Coefficients for Elementary School Districts
.25
.20
.15
.10
.05
.00
Gini Coefficient
Local
Local & State
1965
66
67
68
69
70
71
Year

Figure 6.

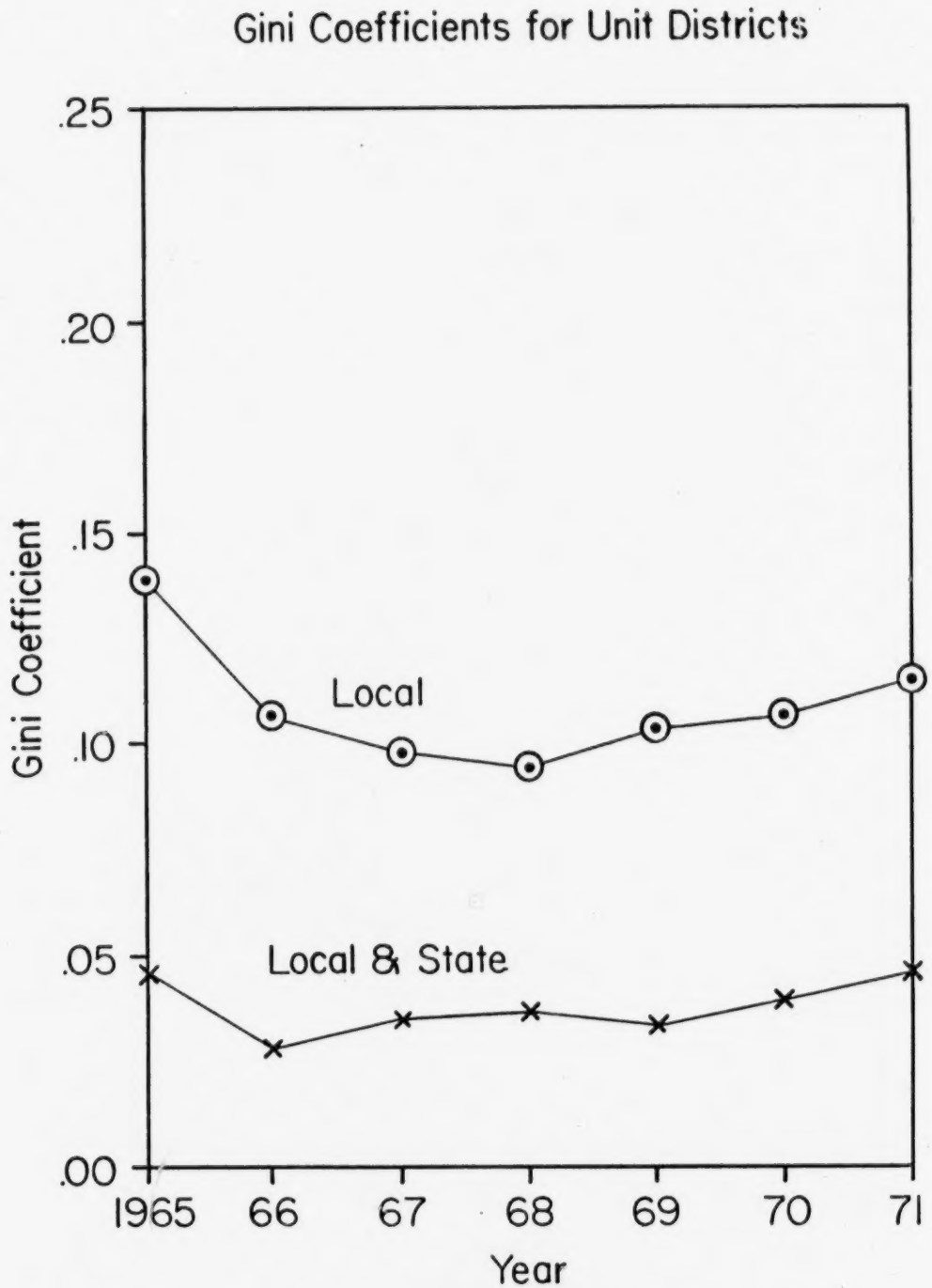

Gini Coefficients for Unit Districts
.25
.20
.15
.10
.05
.00
Gini Coefficient
Local
Local & State
1965
66
67
68
69
70
71
Year

Figure 7.

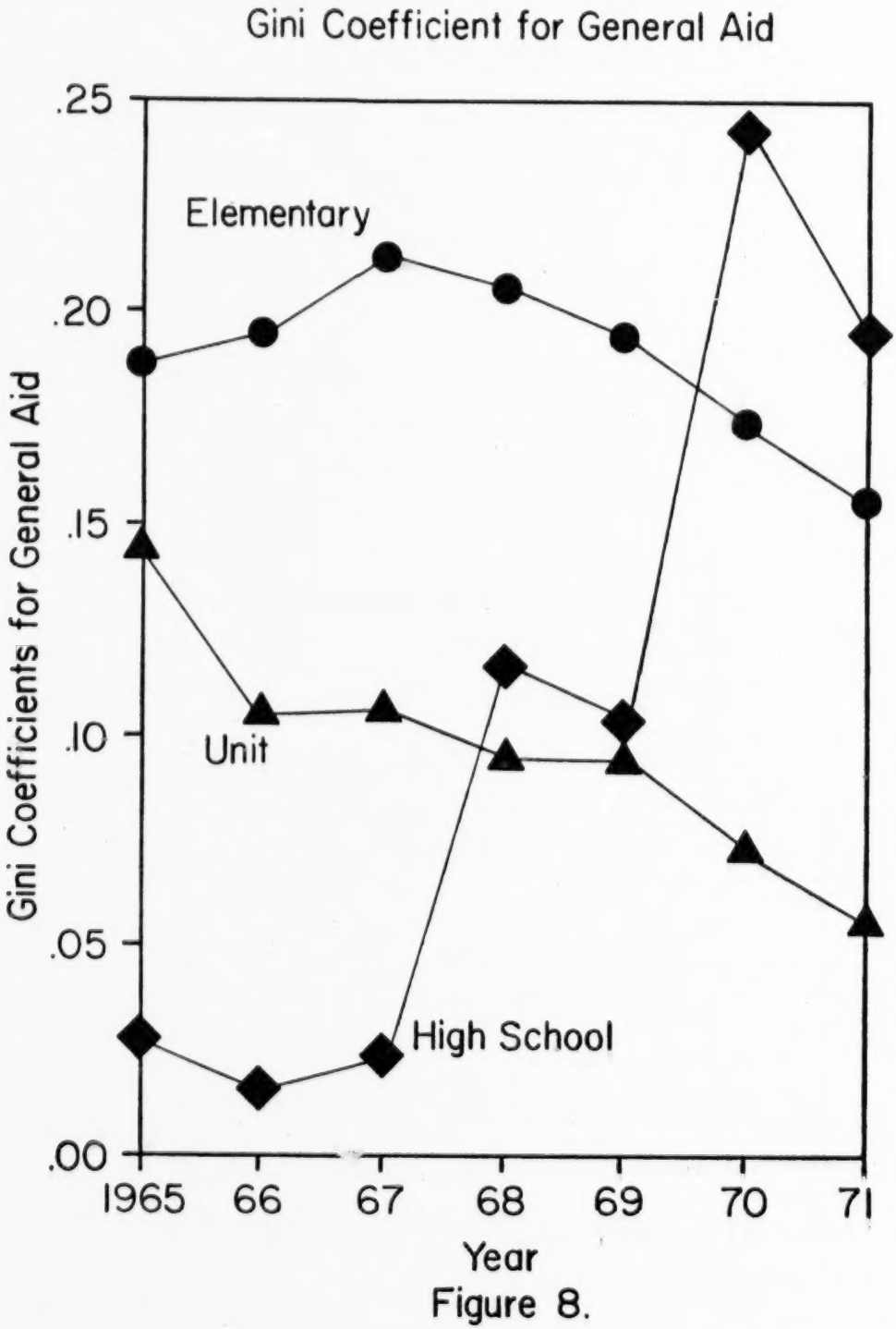

Gini Coefficient for General Aid
.25
.20
.15
.10
.05
.00
Gini Coefficients for General Aid
Elementary
Unit
High School
1965
66
67
68
69
70
71
Year

Figure 8.

Average Total Tax Rates In Unit Districts
by Wealth Quartiles

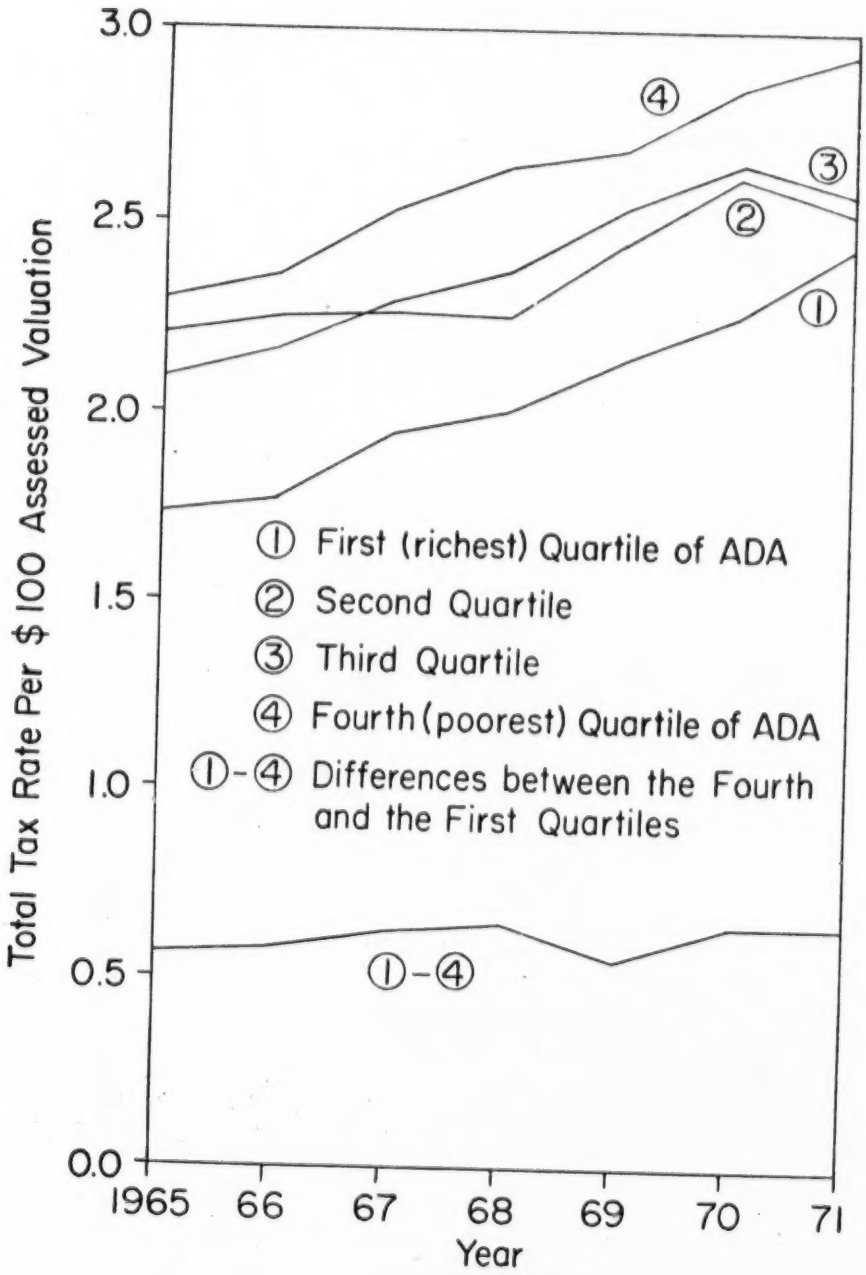


Figure 9

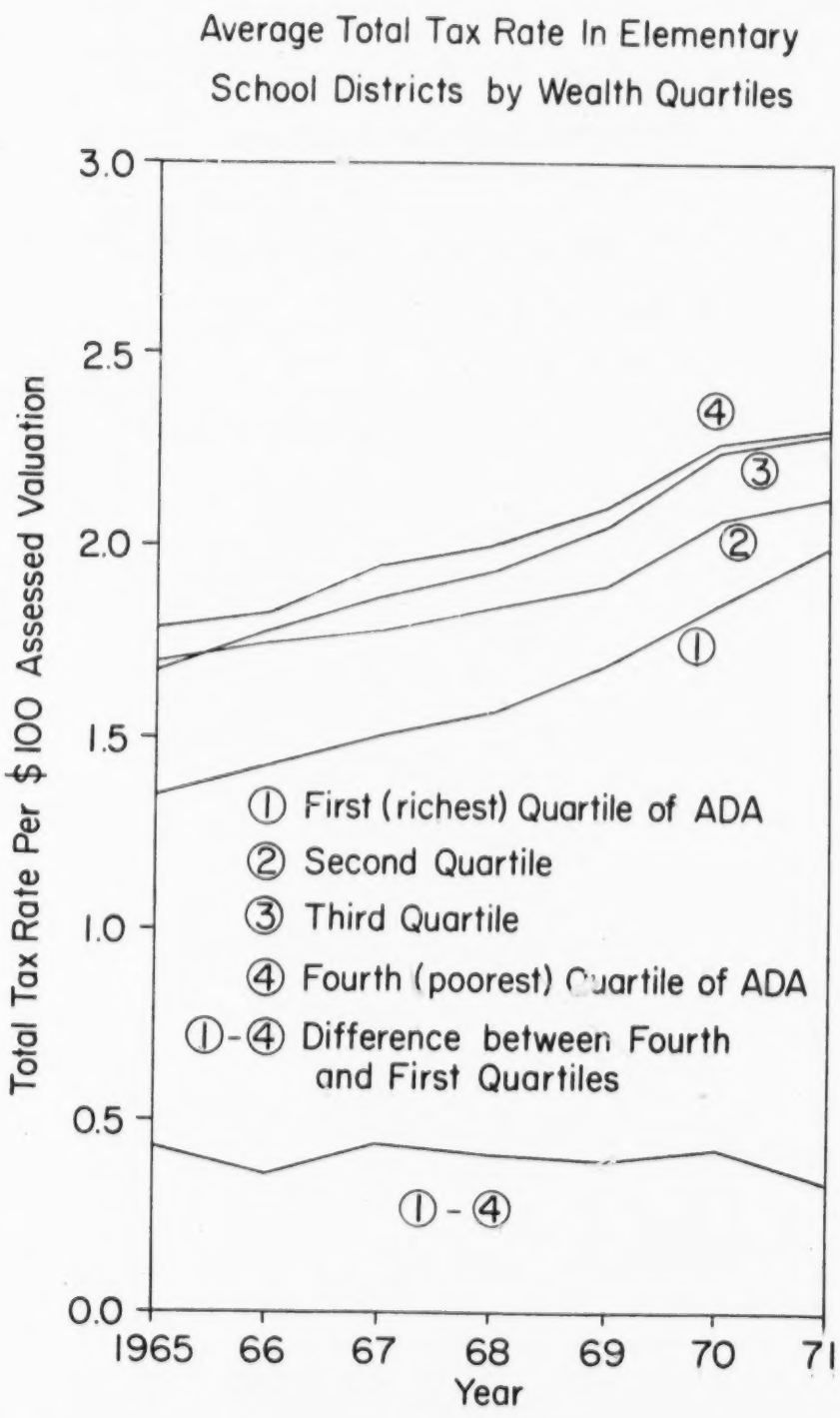

Average Total Tax Rate In Elementary School Districts by Wealth Quartiles
Total Tax Rate Per $100 Assessed Valuation
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1965
66
67
68
69
70
71
Year
④
③
②
①
① First (richest) Quartile of ADA
② Second Quartile
③ Third Quartile
④ Fourth (poorest) Quartile of ADA
①-④ Difference between Fourth and First Quartiles
①-④

Figure 10

Average Total Tax Rates In High School Districts by Wealth. Quartiles

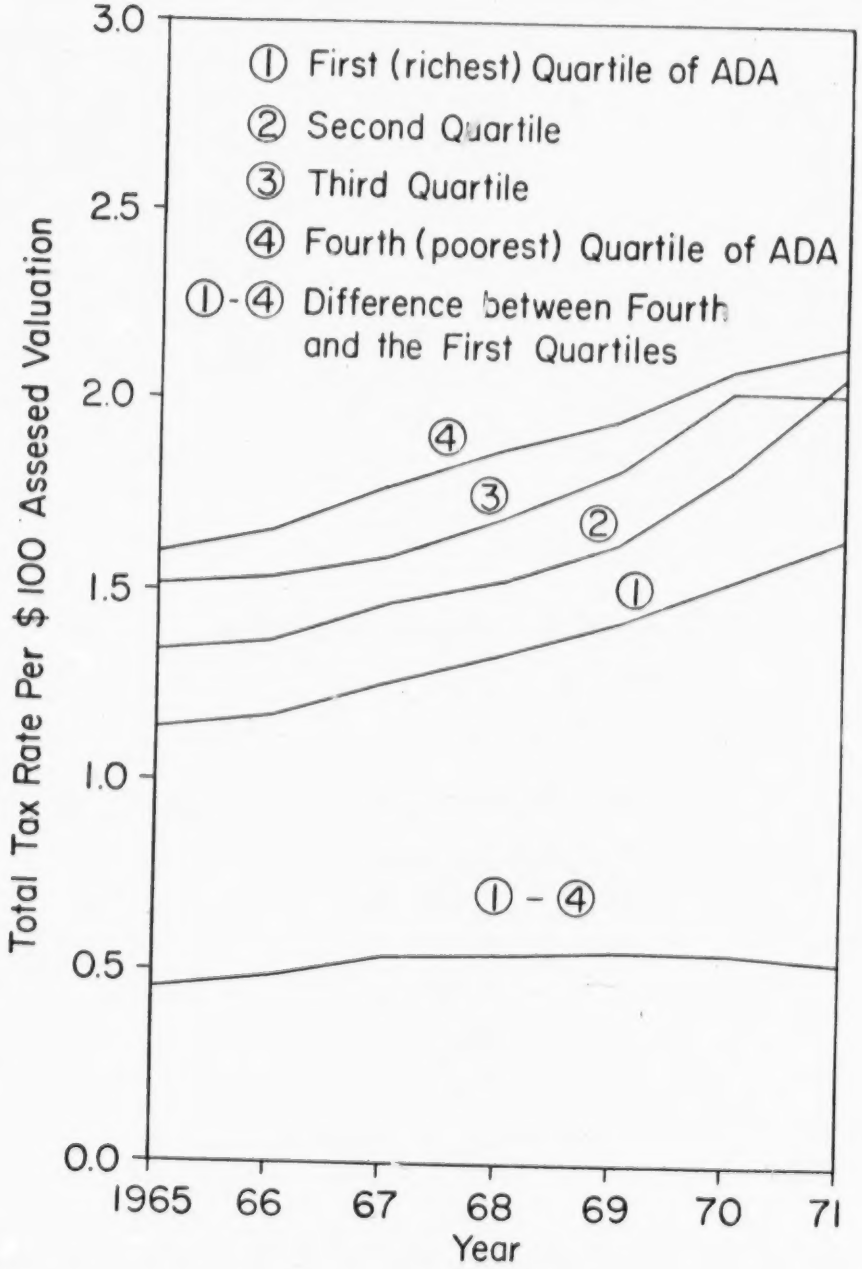


Figure II